

**What is claimed is:**

1. An automatic gear transmission apparatus, capable of cooperating with a gearbox having plural transmission positions, comprising:
  - 5 a motor, adapted for outputting a power;
  - a clutch mechanism, connected to the motor, can optionally output the power of the motor through a first gear set or a second gear set;
  - 10 an actuating apparatus, connected actively to the clutch mechanism and adapted for actuating the clutch mechanism to control the power of the motor to be output from one of the first gear set and the second gear set;
  - a gear selection mechanism, connected to the first gear set and adapted for receiving the power input from the first gear set to proceed a gear selection action; and
  - 15 a gear transmission mechanism, connected to the second gear set and adapted for receiving the power input from the second gear set to proceed a transmission action.
2. The automatic gear transmission apparatus of claim 1, wherein the automatic gear transmission apparatus further comprises a sleeve rod, which is driven by both of the gear selection mechanism and the gear transmission mechanism and, when one of the gear selection mechanism and the gear transmission mechanism drives the sleeve rod to proceed a rotating motion, the another one drives the sleeve rod to proceed a linear motion.
3. The automatic gear transmission apparatus of claim 2, wherein
  - 25 the gear selection mechanism further comprises a rack sleeve fitted fixedly at outside of the sleeve rod, which is engaged with the first gear set, the power from the first gear set can actuate the rack together with the sleeve rod to proceed an axially linear motion along the rotary shaft; and
  - 30 the gear transmission mechanism further comprises a rotary shaft that penetrates through and is arranged in the sleeve rod, which rotates together with the rotary shaft and can proceed an axially relative linear motion on the rotary shaft, one side of the rotary shaft is connected to the second gear set,

the power from the second gear set can actuate the rotary shaft together with the sleeve rod to proceed a rotating motion.

4. The automatic gear transmission apparatus of claim 3, wherein the sleeve rod is a structure of a poking rod arranged at and projected from a hollow sleeve, the position of the projected poking rod is corresponding to the plural transmission positions of the gearbox, wherein

when the power from the first gear set makes the sleeve rod proceed a linear motion, the position of the projected poking rod is switched between the transmission positions to provide a gear selection function; and

- 10 when the power from the second gear set makes the sleeve rod proceed a rotating motion, the position of the projected poking rod pokes its corresponding transmission position to provide a gear transmission function.

5. The automatic gear transmission apparatus of claim 2, wherein the automatic gear transmission apparatus further comprises a shell for accommodating each element of the automatic gear transmission apparatus, and a positioning bead and an elastic element are further arranged at a predetermined position, close to the sleeve rod, of the shell, the elastic element provides an elastic force for making the positioning bead abutted against the sleeve rod; several recesses are further arranged at the sleeve rod 15 at a position corresponding to the positioning bead and, when the sleeve rod proceeds a linear motion, the positioning bead can be correspondingly inset in one of the several recesses to provide a positioning function.

20 6. The automatic gear transmission apparatus of claim 2, wherein

the gear selection mechanism further comprises a rotary shaft that penetrates through and is arranged in the sleeve rod, which rotates together 25 with the rotary shaft and can proceed an axially relative linear motion on the rotary shaft, one side of which is connected to the second gear set, the power from the second gear set can actuate the rotary shaft together with the sleeve rod to proceed a rotating motion; and

30 the gear transmission mechanism further comprises a rack sleeve that is fitted fixedly at outside of the sleeve rod, which is engaged with the first gear set, the power from the first gear set can actuate the rack together with the sleeve rod to proceed an axially linear motion along the rotary shaft.

7. The automatic gear transmission apparatus of claim 6, wherein the sleeve rod is a structure of a poking rod arranged at and projected from a hollow sleeve, the position of the projected poking rod is corresponding to the plural transmission positions of the gearbox, wherein

5       when the power from the second gear set makes the sleeve rod proceed a rotating motion, the position of the projected poking rod is switched between the transmission positions to provide a gear selection function; and

10     when the power from the first gear set makes the sleeve rod proceed a linear motion, the position of the projected poking rod is poked to its corresponding transmission position to provide a gear transmission function.

8. The automatic gear transmission apparatus of claim 1, wherein the motor has an output shaft provided for outputting the rotating power of the motor, and the clutch mechanism further comprises:

15     a coaxially driving gear, fitted fixedly at the output shaft of the motor and is thereby actuated to rotate;

20     a first passive gear, fitted at the output shaft of the motor with a relative rotating motion manner and located at one side of the coaxially driving gear and, when the output shaft rotates, the first passive gear is not actuated, and a first clutch tooth and a first transmitting tooth are further included at the outer edge of the first passive gear, and the first transmitting tooth is engaged with the first gear set;

25     a second passive gear, fitted at the output shaft of the motor with a relative rotating motion manner and located at another side of the coaxially driving gear and, when the output shaft rotates, the second passive gear is not actuated, and a second clutch tooth and a second transmitting tooth are further included at the outer edge of the second passive gear, and the second transmitting tooth is engaged with the second gear set; and

30     a clutch sleeve, fitted at the coaxially driving gear with a relative linear motion manner and thereby actuated to rotate, and a third clutch tooth is arranged at the clutch sleeve, the actuating apparatus can actuate the clutch sleeve to proceed an axially linear motion at the coaxially driving gear; wherein

- when the actuating apparatus brings the clutch sleeve to linearly move to one side of the coaxially driving gear and make the third clutch tooth and the first clutch tooth engaged together, the rotating power output from the motor drives, through the first passive gear, the first gear set to rotate; and
- 5       when the actuating apparatus brings the clutch sleeve to linearly move to another side of the coaxially driving gear and make the third clutch tooth and the second clutch tooth engaged together, the rotating power output from the motor drives, through the second passive gear, the second gear set to rotate.
- 10      9. The automatic gear transmission apparatus of claim 8, wherein the actuating apparatus further comprises:
- a piston, driven to proceed a linear motion; and
- a push rod, arranged at one side of the piston and is driven thereby, and the end side of the push rod is connected actively to the clutch sleeve and,
- 15      when driven by the piston, the push rod pushes the clutch sleeve to proceed a linear motion at the coaxially driving gear.
10. The automatic gear transmission apparatus of claim 9, wherein the piston is driven by a hydraulic cylinder, and the hydraulic cylinder is controlled by an electromagnetic switch valve.
- 20      11. The automatic gear transmission apparatus of claim 8, wherein the actuating apparatus further comprises:
- an electromagnetic valve, driven by an electric power to provide a linear reciprocating driving force; and
- a push rod, connected to one side of the electromagnetic valve and is actuated thereby, and the end side of the push rod is connected actively to the clutch sleeve and, when driven by the electromagnetic valve, the push rod pokes the clutch sleeve to proceed a linear motion at the coaxially driving gear.
- 30      12. The automatic gear transmission apparatus of claim 1, wherein the first gear set and the second gear set are speed-reducing gear sets.
13. The automatic gear transmission apparatus of claim 1, wherein the

automatic gear transmission apparatus further comprises several transmission forks, and each transmission fork is respectively corresponding to one of the plural transmission positions of the gearbox, and each transmission fork is respectively arranged with a position mechanism, each 5 position mechanism further comprises: several recesses, a positioning bead, and an elastic element, the elastic element provides an elastic force to make the positioning bead abutted against the transmission fork and, when the transmission fork proceeds a linear motion, the positioning bead is correspondingly inset with one of the several recesses to provide a 10 positioning function.

14. The automatic gear transmission apparatus of claim 1, wherein a displacement feedback sensor is respectively arranged at the gear selection mechanism and the gear transmission mechanism to detect the positions and states of the gear selection and the gear transmission.

15. An automatic gear transmission apparatus, capable of cooperating with a gearbox having plural transmission positions, comprises:

a power source, adapted for outputting a power;  
a clutch mechanism, connected to the power source, can optionally output the power through a first transmitting mechanism or a second transmitting mechanism;  
an actuating apparatus, connected actively to the clutch mechanism and adapted for actuating the clutch mechanism to control the power of the power source to be output through one of the first transmitting mechanism or the second transmitting mechanism; and

25 a sleeve rod, the position of which is corresponding to the plural transmission positions of the gearbox to proceed a gear selection action and a gear transmission action, and the sleeve rod can be commonly driven by both of the first transmitting mechanism and the second transmitting mechanism, wherein the first transmitting mechanism drives the sleeve rod to proceed a linear motion, and the second transmitting mechanism drives the sleeve rod to proceed a rotating motion.

30 16. The automatic gear transmission apparatus of claim 15, wherein, when driven by the first transmitting mechanism to proceed a linear motion,

the sleeve rod switches among the plural transmission positions to proceed a gear selection, when driven by the second transmitting mechanism to proceed a rotating motion, the sleeve rod pushes its corresponding transmission position to proceed a gear transmission.

5        17. The automatic gear transmission apparatus of claim 15, wherein, when driven by the second transmitting mechanism to proceed a rotating motion, the sleeve rod switches among the plural transmission positions to proceed a gear selection, when driven by the first transmitting mechanism to proceed a linear motion, the sleeve rod pushes its corresponding  
10 transmission position to proceed a gear transmission.

18. The automatic gear transmission apparatus of claim 15, wherein the automatic gear transmission apparatus further comprises:

15        a gear selection mechanism, connected to the first transmitting mechanism and the sleeve rod, further includes a rotary shaft that penetrates through and is arranged in the sleeve rod, which rotates together with the rotary shaft and can proceed an axially relative linear motion at the rotary shaft, one side of the rotary shaft is connected to the first transmitting mechanism, the power from the first transmitting mechanism can actuate the rotary shaft together with the sleeve rod to proceed a rotating motion; and

20        a gear transmission mechanism, connected to the second transmitting mechanism and the sleeve rod, further includes a rack sleeve that is fitted fixedly at outside of the sleeve rod and is engaged with the second transmitting mechanism, the power from the second transmitting mechanism can actuate the rack together with the sleeve rod to proceed an axially linear motion along the rotary shaft.  
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19. The automatic gear transmission apparatus of claim 15, wherein the power source is a motor having an output shaft provided for outputting the rotating power of the motor, and the clutch mechanism further comprises:

30        a coaxially driving gear, fitted fixedly at the output shaft of the motor and is thereby actuated to rotate;

      a first passive gear, fitted at the output shaft of the motor with a relative rotating motion manner and located at one side of the coaxially driving gear and, when the output shaft rotates, the first passive gear is not actuated, and

- a first clutch tooth and a first transmitting tooth are further included at the outer edge of the first passive gear, and the first transmitting tooth is engaged with the first transmitting mechanism;
- 5        a second passive gear, fitted at the output shaft of the motor with a relative rotating motion manner and located at another side of the coaxially driving gear and, when the output shaft rotates, the second passive gear is not actuated, and a second clutch tooth and a second transmitting tooth are further included at the outer edge of the second passive gear, and the second transmitting tooth is engaged with the second transmitting mechanism; and
- 10      a clutch sleeve, fitted at the coaxially driving gear with a relative linear motion manner and thereby actuated to rotate, and a third clutch tooth is arranged at the clutch sleeve, the actuating apparatus can actuate the clutch sleeve to proceed an axially linear motion at the coaxially driving gear; wherein
- 15      when the actuating apparatus brings the clutch sleeve to linearly move to one side of the coaxially driving gear and make the third clutch tooth and the first clutch tooth engaged together, the rotating power output from the motor drives, through the first passive gear, the first transmitting mechanism to rotate; and
- 20      when the actuating apparatus brings the clutch sleeve to linearly move to another side of the coaxially driving gear and make the third clutch tooth and the second clutch tooth engaged together, the rotating power output from the motor drives, through the second passive gear, the second transmitting mechanism to rotate.
- 25      20. The automatic gear transmission apparatus of claim 15, wherein the automatic gear transmission apparatus further comprises a shell for accommodating each element of the automatic gear transmission apparatus, and a positioning bead and an elastic element are further arranged at a predetermined position, close to the sleeve rod, of the shell, the elastic element provides an elastic force for making the positioning bead abutted against the sleeve rod; several recesses are further arranged at the sleeve rod at a position corresponding to the positioning bead and, when the sleeve rod proceeds a linear motion, the positioning bead can be correspondingly inset in one of the several recesses to provide a positioning function.

21. The automatic gear transmission apparatus of claim 15, wherein the first transmitting mechanism and the second transmitting mechanism are speed-reducing gear sets.
22. The automatic gear transmission apparatus of claim 15, wherein the actuating apparatus further comprises:
  - a hydraulic cylinder, controlled by an electromagnetic switch valve to thereby output a power;
  - a piston, connected to the hydraulic cylinder and driven by the hydraulic cylinder to proceed a linear motion; and
  - 10 a push rod, arranged at one side of the piston and is driven thereby, and the end side of the push rod is connected actively to the clutch sleeve and, when driven by the piston, the push rod pushes the clutch sleeve to proceed a linear motion at the coaxially driving gear.